

Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/US05/001168

International filing date: 14 January 2005 (14.01.2005)

Document type: Certified copy of priority document

Document details: Country/Office: US
Number: 60/581,732
Filing date: 22 June 2004 (22.06.2004)

Date of receipt at the International Bureau: 21 February 2005 (21.02.2005)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)



World Intellectual Property Organization (WIPO) - Geneva, Switzerland
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse

1284224

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

February 11, 2005

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE.

APPLICATION NUMBER: 60/581,732

FILING DATE: *June 22, 2004*

RELATED PCT APPLICATION NUMBER: *PCT/US05/01168*



Certified by

Under Secretary of Commerce
for Intellectual Property
and Director of the United States
Patent and Trademark Office

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

PATENT

Docket No.

0-010424USSZ2(P46)

Transmittal of Provisional Application Pursuant to 37 C.F.R. § 1.53(c)

Application of David F. Diehl, Theodore Del Donno, Carla B. Dittman McBain, David M. Lee,
Robert Holmes, and William R. Sands
whose respective 1453 Reserve Dr. Akron, Ohio; 197 Union Street, Holden, MA; 233 Fixler Road,
address(es) are: Wadsworth, OH; 1131 Hummingbird Lane, Rock Hill, SC; 1878 Newton St., Akron
OH; and 847 Renninger Rd., Akron, OH
For BINDER COMPOSITION FOR NON-WOVEN FABRIC

Enclosed is a new provisional patent application. It includes 15 pages of text and 0 sheet(s) of drawings.

1. ☐ Enclosed is an application assignment to OMNOVA Solutions, Inc. and a completed Assignment Recordation Cover Sheet.
2. ☒ Enclosed is Return Receipt Postcard.
3. ☒ The USPTO is authorized to charge the fee pursuant to 37 C.F.R. § 1.16(k) (\$160.00) to Deposit Account No.07-1045. Also, during the pendency of this application, please charge any fees incurred and credit any overpayments made to that same Deposit Account.
4. ☒ Kindly address all correspondence relating to this application to the following address:
Chief Intellectual Property Counsel
OMNOVA Solutions Inc.
175 Ghent Road
Fairlawn, OH 44333-3300

Registration Number	Telephone Number
40,139	330/376-1242
Date	
June 22, 2004	

Signature
<i>Arthur M. Reginelli</i>
Print Name
Arthur M. Reginelli

Certificate of Express Mailing

- ☒ Under 37 C.F.R. § 1.10, I certify that this application is being deposited, on the date indicated below, with the United States Postal Service "Express Mail Post Office to Addressee" service addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Express Mail Mailing Label No.
EL726090325US
Date of Deposit
June 22, 2004

AppITr-Provisional (May-03)

Signature of Person Making Certification
<i>Kimberly A. Bright</i>
Printed Name of Person Making Certification
Kimberly A. Bright

22151 U.S. PTO
60/581732



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the application of)

DAVID F. DIEHL,)
THEODORE DEL DONNO,)
CARLA B. DITTMAN MCBAIN,)
DAVID M. LEE,)
ROBERT HOLMES, and)
WILLIAM R. SANDS)

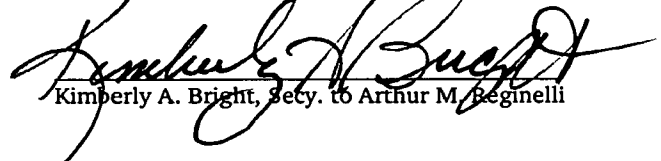
Serial No.)

Filed)

For BINDER COMPOSITION FOR)
NON-WOVEN FABRIC)

**CERTIFICATE OF MAILING
VIA EXPRESS MAIL**

I hereby certify that the following
correspondence was deposited with the United
States Postal Service as Express Mail - Label
EL726090546US - "Express Mail Post Office to
Addressee" service in an envelope addressed to:
Commissioner for Patents, P.O. Box 1450,
Alexandria, VA 22313-1450, on June 22, 2004


Kimberly A. Bright, Secy. to Arthur M. Reginelli

TRANSMITTAL SHEET

Enclosed are the following documents:

Provisional Patent Application (15 pages)
Provisional Patent Application Transmittal Sheet
Return Receipt Postcard

AUTHORIZATION TO CHARGE DEPOSIT ACCOUNT

The Commissioner is hereby authorized to charge payment of any fees
associated with this communication or credit any overpayment to Deposit Account No.07-
1045.

Respectfully submitted,



Arthur M. Reginelli, Reg. No. 40,139
Renner, Kenner, Greive, Bobak, Taylor & Weber
Fourth Floor, First National Tower
Akron, Ohio 44308
(330) 376-1242

June 22, 2004

BINDER COMPOSITIONS

[01] U.S. Provisional Application Serial No. 60/537,592, which was filed on January 16, 2004, is incorporated herein by reference.

5

FIELD OF THE INVENTION

[02] This invention relates to binder compositions; these compositions are useful for non-woven fabrics especially permeable layer of personal hygiene articles.

10

BACKGROUND OF THE INVENTION

[03] A non-woven fabric is a web or continuous sheet of fibers laid down mechanically. The fibers may be deposited in a random manner or oriented in one direction. Most widely used fibers include cellulosics, polyamides, polyesters, polypropylene and polyethylene. The spun fibers, which may be drawn, are laid down directly onto a belt by carding, airlaying or wet-laying. The sheet is then bonded together with a latex binder and subsequently treated in an oven or a calendar to complete the bonding process.

[04] Commonly used lattices for non-woven fabrics are those prepared from polymers of butadiene-styrene, butadiene-acrylonitrile, vinyl acetate, acrylic monomers such as methyl acrylate, ethyl acrylate, methyl methacrylate and the like. When used to bind a non-woven fabric, such as a permeable sublayer of a personal hygiene article, the latex binder should possess several desired physical properties. The desired physical properties include adequate tensile strength, a high modulus or stiffness under certain conditions, and good textile qualities such as tenacity, hand and the like.

25

SUMMARY OF THE INVENTION

[05] In general the present invention provides a binder composition, the binder composition comprising a latex, the latex including a heterogeneous blend of dispersed polymer particles and a surfactant, where the particles have a gel content from about 55 to about 100% by weight of a gelled polymer, from about 1

30

to about 15% by weight polymeric units bearing an acid functionality, and where dried films of the latex exhibit a Tg of from about -50°C to about 60°C.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

5 I. General

[06] The binder compositions are aqueous emulsions or latexes including a heterogeneous blend of dispersed polymer particles. In certain embodiments, these binder compositions preferably include at least one anionic surfactant and optionally at least one surface-active agent.

10 II. Polymer Characteristics

A. Tg

[07] The polymer particles are characterized by having a Tg from about -50°C to about 60°C, preferably from about -35°C to about 35°C, and more preferably from about -25°C to about 25°C. The Tg is typically determined based upon dried samples or films of the latex using DSC techniques.

B. Gel

[08] The polymer particles are also characterized by having a gel content of from about 55 to about 100%, preferably from about 75 to about 98%, and more preferably from about 80 to about 95% based upon the entire weight of the particles. Gel is typically determined based on insoluble fractions within a solvent such as THF or toluene.

C. Acid Content

[09] Further, the polymer particles are characterized by including from about 1 to about 15%, preferably from about 4 to about 12%, and more preferably from about 6 to about 11%, units bearing an acid functionality, *i.e.*, a carboxylic acid group based upon the entire weight of the polymer particles. Acid content can be determined based upon the weight of the acid bearing monomers employed in synthesizing the polymer or by FTIR techniques.

III. Polymer Composition - Qualitative

A. General

[10] The polymer particles include monomeric units deriving from at least one soft monomer, at least one acidic monomer, and optionally at least one hard non-acidic monomer.

B. Soft Monomers

[11] Soft monomers include those that upon polymerization give rise to elastomeric polymers or polymers having a Tg below about 0°C, preferably below about -35°C, and more preferably below about -55°C. Useful soft monomers include conjugated dienes, butyl acrylates, 2-ethyl hexylacrylate, hydroxyethylacrylate, dimethacrylates, polyethylene glycol diacrylates, alkyl acrylates, vinyl versatate derived monomers, and mixtures thereof. Exemplary conjugated dienes include, but are not limited, 1,3-butadiene, isoprene, 1,3-pentadiene, 1,3-hexadiene, 2,3-dimethyl-1,3-butadiene, 2-ethyl-1,3-butadiene, 2-methyl-1,3-pentadiene, 3-methyl-1,3-pentadiene, 4-methyl-1,3-pentadiene, and 2,4-hexadiene.

C. Acidic Monomers

[12] Acidic monomers include those molecules that include both a carboxylic acid group as well as a polymerizable group. These acidic monomers can include both hard and soft monomers.

[13] Useful acidic monomers include α , β -unsaturated carboxylic acids, vinyl versatic acids, and mixtures thereof. Exemplary, α , β -unsaturated carboxylic acids include, but are not limited to, methacrylic acid, itaconic acid, citraconic acid, cinnamic acid, acrylic acid, fumaric acid, maleic acid, acids derived from anhydrides such as maleic anhydride, and mixtures thereof.

D. Optional Hard Non-Acidic Monomers

[14] The hard non-acidic monomers include those monomers that do not include a carboxylic acid functionality and that upon polymerization give rise to thermoplastic polymers or those polymers having a Tg in excess of about 0°C, preferably in excess of about 75°C, and more preferably in excess of about 90°C. Useful hard non-acidic monomers include vinyl aromatic monomers such as styrene, α -methyl styrene, *t*-butyl styrene, alkyl substituted styrene, divinyl

benzene, and mixtures thereof, as well as polyunsaturated divinyl compounds. Other useful hard non-acidic monomers include acrylates such as methyl methacrylate, butyl methacrylate, vinyl acetate, and mixtures thereof. Still other useful hard non-acidic monomers include acrylamides such as methyl acrylamide, 5 2-acrylamido-2-methylpropane sulfonic acid, the salts of this acid (e.g., sodium, potassium, or ammonium salts), and mixtures thereof.

IV. Polymer Composition – Quantitative

A. General

10 **[15]** In order to achieve the desired polymer characteristics set forth above, the relative amounts of the various monomer employed to synthesize the polymer may be tailored. Also, especially in the case of the gel content, the degree of gel can be controlled by manipulating the conversion time, the polymerization temperature, and the type and level of chain transfer agent.

15 B. Soft Monomer

[16] In one embodiment, the polymer particles preferably include from about 75 to about 15% by weight, preferably from about 65 to about 25% by weight, and more preferably from about 60 to about 35% by weight units deriving from soft monomer, based upon the entire weight of the particle.

20 C. Hard Non-Acidic

[17] In order to achieve the desired Tg level, the polymer particles may preferably include from about 15 to about 75% by weight, preferably from about 25 to about 65% by weight, and even more preferably from about 35 to about 60% by weight hard non-acidic monomer, based upon the entire weight of the particle, 25 units deriving from hard non-acidic monomer. Those skilled in the art will appreciate the level of hard monomer employed in synthesizing the polymer is directly related to the Tg of the polymer. In other words, as the level of hard monomer is increased, the Tg will increase.

30 V. Preferred Polymer

[18] In one particularly preferred embodiment, the polymer particles include copolymers synthesized from monomers including 1,3-butadiene, styrene,

methacrylic acid, acrylic acid and optionally itaconic acid. Preferably, the polymer particles include from about 35 to about 70% by weight monomeric units deriving from 1,3-butadiene, from about 15 to about 75% by weight monomeric units deriving from styrene, from about 0 to about 8% by weight monomeric units deriving from methacrylic acid, and from about 0 to about 8% by weight monomeric units deriving from acrylic acid, based on the entire weight of the particle. More preferably, the polymer particles include from about 40 to about 65% by weight monomeric units deriving from 1,3-butadiene, from about 25 to about 65% by weight monomeric units deriving from styrene, from about 1 to about 7% by weight monomeric units deriving from methacrylic acid, and from about 1 to about 7% by weight monomeric units deriving from acrylic acid, based on the entire weight of the particle. Even more preferably, the polymer particles include from about 45 to about 60% by weight monomeric units deriving from 1,3-butadiene, from about 35 to about 45% by weight monomeric units deriving from styrene, from about 2 to about 6% by weight monomeric units deriving from monomeric units deriving from methacrylic acid, from about 0.5 to about 3% by weight monomeric units deriving from deriving from itaconic acid, and from about 2 to about 6% by weight monomeric units deriving from acrylic acid, based on the entire weight of the particle. Still more preferably, the polymer particles include from about 48 to about 58% by weight monomeric units deriving from 1,3-butadiene, from about 37 to about 43% by weight monomeric units deriving from styrene, from about 2.5 to about 5.0% by weight monomeric units deriving from monomeric units deriving from methacrylic acid, from about 1 to about 2% by weight monomeric units deriving from deriving from itaconic acid, and from about 2.5 to about 5.0% by weight monomeric units deriving from acrylic acid, based on the entire weight of the particle.

VI. Binder Composition

A. Qualitative

[19] The binder compositions of this invention include an aqueous emulsion or latex of the polymer particles disclosed above. Additionally, this composition preferably includes a surfactant.

[20] In one embodiment, the surfactant includes an alkali metal salt of an alkyl sulfosuccinate. Useful alkali salts of alkyl sulfosuccinates include sodium dihexyl sulfosuccinate, sodium dioctyl sulfosuccinate, sodium octane sulfonate, alkyl phenol ethoxylates, fatty alcohol ethoxylates, alkyl polyglucosides, alkyl phosphates, and mixtures thereof.

[21] In another embodiment, the surfactant includes salts of alkyl sulfates, salts of organo disulfonates. Useful salts of alkyl sulfates include sodium lauryl sulfate, which is available under the tradename Stepanol WA. Useful salts of organo disulfonates include sodium dodecyl diphenyloxide disulfonate, which is available under the tradename Dowfax 2A1. Other useful surfactants include sodium laureth sulfate, Laureth-3 (a.k.a. triethylene glycol dodecyl ether), Laureth-4 (a.k.a. PEG-4 lauryl ether), Laureth-5 (a.k.a. PEG-5 lauryl ether), Laureth-6 (a.k.a. PEG-6 lauryl ether), Laureth-7 (a.k.a. PEG-7 lauryl ether), sodium lauryl ether sulfate, sodium laureth-12 sulfate (a.k.a. PEG (12) lauryl ether sulfate), and sodium laureth-30 sulfate (a.k.a. PEG (30) lauryl ether sulfate).

[22] In yet another embodiment, especially where the binder composition is foamed, the composition may include disodium stearyl sulfosuccinamate, which is available under the tradename Aerosol 18. This surfactant is preferably employed in conjunction with one or more of the surfactants described above.

B. Quantitative

1. Surfactant

[23] The surfactant is typically present within the binder composition in an amount from about 0.1 to about 10% by weight, preferably from about 1 to about 6% by weight, even more preferably from about 2 to about 4% by weight based upon the total weight of the composition. Stated another way, the surfactant is present in an amount from about 0.25 to about 0.65, preferably from about 0.35 to about 0.55, more preferably from about 0.40 to about 0.50, and still more preferably from about 0.44 to about 0.48 parts by weight surfactant per 100 parts by weight polymer, where the parts by weight surfactant refer to active surfactant content.

VII. Polymer/Emulsion Preparation

A. General

[24] The emulsion polymer of this invention is preferably prepared by employing conventional emulsion polymerization techniques such as those described in U.S. Patent Nos. 5,166,259 and 6,425,978, which are incorporated herein by reference. In general, these processes employ the use of a free-radical initiator to initiate the polymerization of monomer in the presence of a surfactant. Advantageously, this polymerization takes place in the presence of the surfactant that is preferably present in the binder composition.

B. Polymerization Techniques

[25] Preparation of the polymers or latexes of this invention is not limited to any particular emulsion polymerization technique. Accordingly, a single-charge batch polymerization process may be used, a continuous system may be used, which typically employs a CSTR, a semi-batch or continuous-feed process may be used, or an incremental process may be employed.

[26] Polymerization is typically carried out at a temperature of about 60°C to about 90°C, and preferably from about 65 to about 80°C.

C. Initiators

[27] Any of those free-radical emulsion polymerization initiators conventionally employed in the art may be employed in preparing the polymers or emulsion latexes of this invention. Exemplary initiators include ammonium persulfate, sodium persulfate, potassium persulfate, *tert*-butyl hydroperoxide, and di-*tert*-butyl cumene. These initiators may be used in conjunction with a reducing agent such as iron salts, amines, ascorbic acids, sodium salts of ascorbates, sodium formaldehyde sulfoxylates, and mixtures thereof. Conventional amounts of initiator and reducing agent can be used in preparing the latexes of this invention. For example, in one embodiment, about 0.05 to about 2.5, and preferably from about 0.1 to about to about 2.0 parts by weight initiator per 100 parts by weight monomer is used.

D. Surfactants

[28] The surfactant employed during the polymerization process may include any of those surfactants conventionally employed in the art. As noted above, the

preferred surfactant includes those that are also useful for the binder composition. In addition to those described above, other surfactants that may be used (in addition to or in lieu of those described) include alkyl sulfates, alkyl sulfosuccinates, alkyl aryl sulfonates, α -olefin sulfonates, fatty or rosin acids salts, NPE, alkyl aryl sulfonates, alkyl phenol ethoxylates, fatty acid alcohol ethoxylates, and mixtures thereof.

[29] Conventional amounts of the surfactant can be used in synthesizing the latex, although it may be preferred to employ the type and amount of surfactant used in the binder composition.

10 **[30]** In one embodiment, the surfactant includes a blend of sodium dihexyl sulfosuccinate and sodium dioctyl sulfosuccinate. The blend can be adjusted to control or obtain a desired critical micelle concentration. The dihexyl to dioctyl weight ratio can vary from 0.05:1 to 1:0.05.

E. Chain Transfer Agents

15 **[31]** Any of those chain transfer agents conventionally employed in the emulsion polymerization of conjugated diene monomers may be employed in preparing the polymers or latexes of this invention. Exemplary chain transfer agents include, alkyl mercaptans, carbon tetrachloride, carbon tetrabromide, C₂-C₂₂ n-alkyl alcohols, C₂-C₂₂ branched alcohols, 2,4-diphenyl-4-methyl-1-pentene, and mixtures thereof.

[32] Conventional amounts of the chain transfer agent can be used in synthesizing the latex, although it may be preferred to employ the type and amount of chain transfer agent used in the binder composition.

F. Neutralizing Agents

25 **[33]** The pH of the latex can be neutralized by the addition of a base such as potassium hydroxide, sodium bicarbonate, ammonium hydroxide, sodium hydroxide, organic amines such as triethylamine, AMP 95, and mixtures thereof.

[34] As those skilled in the art will appreciate, it is conventional to neutralize the latex to a pH of about 4.5 to about 8.0, and preferably from about 5.5 to about 7.5.

G. Preferred Method

5 **[35]** In one preferred method, the polymers or emulsions utilized in the present invention are prepared by employing an incremental polymerization technique. Even more preferably, the method includes the use of a polymer seed
10 such as one prepared by the polymerization of itaconic acid and styrene in the presence of a suitable surfactant. Once the seeds are prepared, incremental additions of butadiene monomer, styrene monomer, and acrylic and methacrylic acid monomer, initiator, chain transfer agent, and surfactant are introduced. A similar technique is set forth in U.S. Patent No. 6,425,978, which is incorporated
10 herein by reference.

VIII. Binder Preparation

15 **[36]** Depending on the polymerization technique employed, and more specifically the type and quantity of surfactant employed, the latex resulting from the polymerization discussed above can be employed as the binder composition. Alternatively, surfactant can be post added to the latex after polymerization. Likewise, the surface-active agents can be post added after polymerization.

20 **[37]** In one embodiment, the polymer is polymerized in the presence of an alkali metal salt of an alkyl sulfate (e.g. sodium lauryl sulfate) and an alkali metal salt of an organodisulfonate (e.g. sodium dodecyl diphenyloxide disulfonate) is post added.

IV. Use of Binder

A. General

25 **[38]** The binder compositions of this invention are particularly useful for binding non-woven fabrics. In one embodiment, the binder can be used to bind the permeable sub-layers of personal hygiene articles such as diapers and feminine hygiene articles.

30 **[39]** The permeable sub-layer of the personal hygiene article is a web or mat comprised of randomly arranged non-woven fibers having an open structure and high loft. The web may be formed by carding when the fibers have an appropriate length and flexibility. During carding, the crimped fibers are placed on a moving support and then treated with the binder composition.

5 **[40]** The fibers may include natural textile fibers such as jute, sisal, ramie, hemp, and cotton as well as many artificial organic textile fibers or filaments including rayon, those of cellulose esters such as cellulose acetate, vinyl resin fibers such as those of polyvinyl chloride, copolymers of vinyl chloride with vinyl acetate, vinylidene chloride or acrylonitrile, copolymers of acrylonitrile with vinyl chloride, vinyl acetate, methacrylonitrile, vinyl pyridine, polymers and copolymers of olefins such as ethylene and propylene, also condensation polymers such as polyamides or nylon types, polyesters such as ethylene glycol terephthalate polymers and the like.

10 **[41]** The fibers may be of one composition or mixtures of fibers in a given web. The preferred fibers include polyolefins, especially polyesters, poly(ethylene terephthalate), and acrylics, polyamides, polypropylene. The polyolefin fibers include polypropylene, polyethylene, polybutene and their copolymers. The polyester fibers include any long chain synthetic polymer composed of at least 85% by weight of an ester of a dihydric alcohol and terephthalic acid such as
15 polyethylene terephthalate, and, in addition liquid crystal polyesters, thermotropic polyesters and the like. The acrylic fibers include any fiber forming substance containing a long chain synthetic polymer composed of at least 85% by weight acrylonitrile units $--CH_2 CH(CN)--$. Other types of fibers may also be employed such as high modulus fibers more commonly known as graphite fibers made from
20 rayon, polyacrylonitrile or petroleum pitch.

[42] The fibers may be of most any suitable size and randomly arranged to most any suitable thickness depending upon the desired end use of the non-woven fabric. The fibers are typically of a length of about 0.25 to 2 inches and typically about 1.2-15 denier.

25 **[43]** The fibers may be laid in an overlapping, intersecting random arrangement to a thickness of about 0.25 inches or less to form a mat of fibers. The fibers may be arranged by most any convenient known manner such as by wet laying, air-laying or carding.

B. Application Method

30 **[44]** The fabric of the present invention is made by forming a mat of randomly arranged fibers. After the fibers are randomly arranged as desired, the binder compound is applied to the fibers. The latex binder is applied in an

effective amount which will result in the fabric having sufficient strength and cohesiveness for the intended end use application. As well known in the art, the latex binder may be applied to the layer of randomly arranged fibers in a spaced, intermittent pattern of binder sites, or uniformly applied throughout the layer of fibers. The exact amount of the latex binder employed depends, in part, upon factors such as the type of fiber, weight of fibrous layer, nature of latex binder and the like. For example, end uses that require a stronger fabric may utilize more binder. A typical content of latex binder applied on a fiber mat (i.e. binder content) is about 15-45, preferably about 20-40, and more preferably about 25-35 wt %.

C. Curing

[45] The latex is then cured using methods well known in the art such as by application of heat or radiation. The term "cured" refers to the latex being cross-linked to increase the tensile strength properties. The curing of the treated fibers is affected at a temperature above the glass transition temperature of the binder.

[46] In order to demonstrate the practice of the present invention, the following examples have been prepared and tested. The examples should not, however, be viewed as limiting the scope of the invention. The claims will serve to define the invention.

EXAMPLES

Example 1

[47] A batch reactor was initially charged with 73.4 parts by weight of the ionized water, 1.5 parts by weight of itaconic acid, an iron scavenger (EDTA), 4.2 parts by weight sodium dialkyl sulfosuccinate (a blend of about 90% by weight dihexyl and about 10% by weight dioctyl), and 3.5 parts by weight styrene.

[48] About 0.45 parts by weight sodium persulfate and about 4.05 parts by weight deionized water were then added to the reactor. The reactor was then evacuated with a vacuum, purged with nitrogen, and maintained at about 80°C for about 30 minutes.

[49] About 37.6 parts by weight additional styrene, about 48.5 parts by weight butadiene, about 4.8 parts by weight acrylic acid, about 4 parts by weight methyl acrylic acid, and about 1 part by weight chain transfer agent were

sequentially added to the reactor in various increments over the course of about 6 hours. The resulting polymer had a theoretical solids content of about 50.5% by weight, a theoretical glass transition temperature (T_g) of -17.9, an acid content of about 10.26 weight percent, and a gel content of about 73.2%.

- 5 **[50]** The resulting latex binder was then applied to polyester fibers. After applying a latex binder to the non-woven fibers, the latex binder was oven dried at about 100°C to bond the fibers and then cured at about 150°C to form a dimensionally stable non-woven fabric.

Example 2

- 10 **[51]** A batch reactor was initially charged with 73.4 parts by weight of the ionized water, 1.5 parts by weight of itaconic acid, an iron scavenger (EDTA), 0.2 parts by weight of a 0.25 active sodium lauryl sulfate, and 3.5 parts by weight styrene.

- 15 **[52]** About 0.45 parts by weight sodium persulfate and about 4.05 parts by weight deionized water were then added to the reactor. The reactor was then evacuated with a vacuum, purged with nitrogen, and maintained at about 80°C for about 30 minutes.

- 20 **[53]** About 37.6 parts by weight additional styrene, about 48.5 parts by weight butadiene, about 4.8 parts by weight acrylic acid, about 4 parts by weight methyl acrylic acid, and about 1.74 parts by weight of the 0.25 active sodium lauryl sulfate, and about 1 part by weight chain transfer agent were sequentially added to the reactor in various increments over the course of about 6 hours. The resulting polymer had a theoretical solids content of about 49.2% by weight, a theoretical glass transition temperature (T_g) of -17.9, an acid content of about
25 10.26 weight percent, and a gel content of about 73.2%.

- [54]** Various modifications and alterations that do not depart from the scope and spirit of this invention will become apparent to those skilled in the art. This invention is not to be duly limited to the illustrative embodiments set forth herein.

CLAIMS

What is claimed is:

1. A binder composition for a non-woven fabric, the binder composition comprising:

5 a latex, the latex including a heterogeneous blend of dispersed polymer particles and a surfactant, where the particles include from about 55 to about 100% by weight of a gelled polymer, from about 1 to about 15% by weight polymeric units bearing an acid functionality, and where dried films of the latex exhibit a Tg of from about -50°C to about 60°C.

10

2. The binder composition of claim 1, where the polymer particles includes from about 75 to about 95% by weight of a gelled polymer.

3. The binder composition of claim 2, where the polymer particles include from
15 about 80 to about 93% by weight of a gelled polymer.

4. The binder composition of claims 1 and 2, where the polymer particles include from about 3 to about 12% by weight polymeric units bearing an acid functionality.

20

5. The binder composition of claims 1 and 3, where the polymer particles include from about 4 to about 11% by weight polymeric units bearing an acid functionality.

25 6. The binder composition of claims 1, 2, and 4, where dried films of the latex exhibit a Tg of from about -35°C to about 35°C.

7. The binder composition of claims 1, 3, and 5, where dried films of the latex exhibit a Tg of from about -35°C to about 35°C.

30

8. The binder composition of claims 1, 2, 4, and 6, where the gelled polymer includes from about 15 to about 75% by weight units deriving from conjugated diene monomer.

9. The binder composition of claims 1, 3, 5, and 7, where the gelled polymer includes from about 25 to about 65% by weight units deriving from conjugated diene monomer.

5

10. The binder composition of claim 9, where the gelled polymer includes from about 35 to about 60% by weight units deriving from at least one of conjugated diene monomers.

10 11. The binder composition of claims 8, 9, and 10, where the conjugated diene monomer is 1,3-butadiene.

12. The binder composition of claims 1, 4, and 5, where the polymeric units bearing an acid functionality derive from acrylic acid, methacrylic acid, itaconic acid, or mixtures thereof.

15

13. The binder composition of claim 12, where the polymeric units bearing an acid functionality comprise from about 0 to about 3% by weight units deriving from itaconic acid, from about 2 to about 7% by weight units deriving from acrylic acid, and from about 1 to about 6% by weight units deriving from methacrylic acid.

20

14. The binder composition of claim 13, where the polymeric units bearing an acid functionality comprise from about 1 to about 2% by weight units deriving from itaconic acid, from about 4 to about 6% by weight units deriving from acrylic acid, and from about 3 to about 5% by weight units deriving from methacrylic acid.

25

15. The binder composition of claim 1, where the surfactant includes an alkali metal salt of an alkyl sulfosuccinate.

30

16. The binder composition of claim 15, where the alkali metal salt of an alkyl sulfosuccinate includes alkali metal salts of mono and dialkyl sulfosuccinates, and where the alkyl substituents include from about 5 to about 12 carbon atoms.

5 17. The binder composition of claim 16, where the alkyl substituents of the sulfosuccinate includes from about 6 to about 8 carbon atoms.

18. The binder composition of claim 17, where the surfactant includes from about 50 to about 99% by weight sodium dihexyl sulfosuccinate compounds and
10 from about 1 to about 50% by weight sodium dioctyl sulfosuccinate compounds.

19. The binder composition of claims 1, 15, and 18, where the latex composition includes from about 1 to about 6% by weight surfactant.

15 20. The binder composition of claim 19, where the latex composition includes from about 2 to about 4% by weight surfactant.

21. The binder composition of claims 1, 6, and 7, where the polymer particles include from about 15 to about 75% by weight units deriving from styrene.
20

22. The binder composition of claim 21, where the polymer particles include from about 25 to about 65% by weight units deriving from styrene.

23. The binder composition of claim 22, where the polymer particles include
25 from about 35 to about 45% by weight units deriving from styrene.

24. A non-woven fabric bound with the binder composition of claim 1.

25. A diaper sub-layer comprising a non-woven fabric bound with the binder
30 composition of claim 1.